

A Subway and Rapid Transit System . . .

for San Francisco

Report to Mayor Elmer E. Robinson
by Paul Oppermann, Director of Planning

APRIL 1950

San Francisco Department of City Planning

*Including report to City Planning Commission
By DeLeww, Cather and Company . . .*

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CITY AND COUNTY OF SAN FRANCISCO

DEPARTMENT OF CITY PLANNING

100 LARKIN STREET · CIVIC CENTER · SAN FRANCISCO 2, CALIFORNIA

ELMER E. ROBINSON
MAYOR

PAUL OPPERMAN
DIRECTOR OF PLANNING
JOSEPH MIGNOLA, JR.
SECRETARY

April 11, 1950

The Honorable Elmer E. Robinson, Mayor
City and County of San Francisco
200 City Hall, Civic Center
San Francisco 2

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MANAGER OF UTILITIES

Dear Mayor Robinson:

Transmitted herewith is a report and recommendations on a subway and rapid transit plan, made pursuant to your request of December 29, 1949.

You requested a review of previous proposals for a subway under Market Street, and recommendations concerning such a subway "in order that full and complete information on the subway may be placed before the people."

Your assignment was approached with a full recognition of the dual aspect of the study: 1) the overall aspect of the transit system plan as a major feature of the comprehensive Master Plan of the City and County of San Francisco, of fundamental concern to the City Planning Commission, and 2) the engineering and operational aspects of the problem, of fundamental concern to the Public Utilities Commission.

In order to obtain adequate and expert engineering services within the time limits specified in your request, the City Planning Commission employed De Leuw, Cather & Company as engineering consultants to undertake a detailed engineering study of an initial subway development and make qualified estimates of cost of such a program. The report of the consultants is attached to this report.

Numerous conferences have been held during the course of the study between staff members of the Department of City Planning, A.O. Olson, Chief Engineer of the Utilities Engineering Bureau, L.M. Perrin, Senior Engineer, Utilities Engineering Bureau, Col. Marmion Mills, Consultant to the Public Utilities Commission, William Scott, General Manager of the Municipal Railway, and Charles E. De Leuw and other representatives of De Leuw, Cather & Company. The recommended subway and rapid transit plan and development program submitted herewith has been reviewed thoroughly by all of the above persons concerned.

Very truly yours,

Paul Oppermann
Paul Oppermann
Director of Planning

ACKNOWLEDGEMENTS

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Completion of this report within the limited time period is due to the very cooperative and responsive help given by many persons and organizations.

Without the full cooperation and participation given by James H. Turner, Manager of Utilities, Col. Marmion D. Mills, Consultant to the Public Utilities Commission, A. O. Olson, Chief Engineer of the Utilities Engineering Bureau, L. M. Perrin, Senior Electrical Engineer, Utilities Engineering Bureau, and William Scott, General Manager of the Municipal Railway, this report could not have been completed.

Appreciation is also due Sherman P. Duckel, Director of Public Works, Ralph Wadsworth, City Engineer, and A. V. Bowhay, Engineer, Bureau of Engineering, for furnishing information and data on sewer locations and plans, for use by the engineering consultants.

Acknowledgement is also made of the aid given by Mark Sullivan, President, and R. C. Caughell, Division Plant Engineer, of the Pacific Telephone and Telegraph Company in furnishing data on existing and proposed underground telephone conduits, and to James B. Black, President, and Messrs. Searle, Walls, and Botterini of the San Francisco Division of the Pacific Gas and Electric Company for the data provided on gas and power lines in the affected area. Acknowledgement is also made of the help given by Howard C. Wood, Chief Engineer of the San Francisco-Oakland Bay Bridge in furnishing data on the Bay Bridge Terminal structure.

Information and help given by Col. S. H. Bingham, Chairman of the Board of Transportation of New York City; H. C. Patten, General Manager of the Toronto Transportation Commission; and Edwin B. Meissner, President, and E. C. Wrausmann, Vice-President, of the St. Louis Car Company, is gratefully acknowledged.

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A Report to the City Planning Commission by
De Leuw, Cather & Company

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Summary of Recommendations

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1. It is recommended that a first-stage program of construction be undertaken on a subway and rapid transit system in the amount of \$50,100,000.
2. It is recommended that a two-track subway be constructed under Market Street between the Bay Bridge Terminal and Gough Street at a cost of \$23,500,000.
3. It is recommended that two routes be initially established:
 - 1) a Twin Peaks route, extending from the Market Street subway through the Twin Peaks Tunnel and under West Portal Avenue to a terminal at St. Francis Circle. This route, including 60 specially designed rapid transit cars will cost \$8,500,000.
 - 2) a Sunset route, extending from the Market Street subway through the Sunset Tunnel, under Frederick Street to Arguello Boulevard, and along the southern border of Golden Gate Park to a terminal at Nineteenth Avenue. This route, including 30 specially designed rapid transit cars, will cost \$8,500,00.
4. Costs for fixed equipment, including track and power facilities for the system are estimated to be \$5,800,000.
5. A division terminal with storage and maintenance facilities is recommended for construction between Market, Mission, Fremont, and Beale Streets. This will cost \$6,800,000, but approximately \$3,000,000 can be recouped through the resale of air rights.
6. It is recommended that additional equipment needed for completion of the rehabilitation of the present surface transit system be authorized at this time. Costs will be estimated by the Public Utilities Commission.

I. The Transit Problem and the Shelf of Solutions

Anyone who knows San Francisco knows that its most obvious transportation problem is Market Street. Like an arrow it cuts diagonally across the City from The Embarcadero to Twin Peaks. It pierces the heart of Downtown San Francisco. All but seven percent of the streets leading into the Downtown district converge on it. Practically everything and everybody gets jammed up at or on Market Street. Street cars average only $5\frac{1}{2}$ miles per hour along its surface during the evening peak hour of travel. Buses and automobiles wait up to five minutes to get across it.

When Jasper O'Farrell in 1849 enlarged the rectangular street system earlier established along the shores of Yerba Buena Cove he showed great wisdom for his time in establishing the 120-foot width of Market Street. But he also established the primary cause of San Francisco's unique circulation problem today when he laid out a separate system of streets south of Market Street, disconnected and unrelated to those north of Market Street. There are 28 streets converging on Market Street from the north and west between First and Tenth Streets, but only eight streets to carry their traffic across Market to the south. No greater barrier to smooth circulation than those two street systems was ever constructed.

Of the 29 existing radial transit lines which link the outlying districts of the City with Downtown, all but four either enter Market Street at the inner portion of their route, cross Market Street, or stop at the Market Street barrier, requiring a transfer for completion of a transit journey to the eastern end of Market Street. Of the lines stopping at Market Street half of the eight routes formerly entered Market Street, but total volumes of vehicles and passengers have increased so that these lines can no longer be absorbed into the traffic stream.

Traffic attempting to cross Market Street is congested and delayed by traffic on Market Street, and the saturation of traffic on Market Street is congested and delayed by traffic attempting to cross it. Thus Market Street, the great wide boulevard of downtown San Francisco, is also its great obstacle to a smooth flowing circulation system.

Market Street Subway Is of Long Standing

The key importance of Market Street has long been as obvious as it is today, and every consideration given to the improvement of circulation, and particularly toward the improvement of transit over the past fifty years, has included major recommendations for increasing the capacity and efficiency of Market Street through "vertical widening" by means of a subway.

Daniel Burnham, noted city planner of his time, in 1905 in his Report on a Plan for San Francisco foresaw the need for a system of rapid transit subways as the City grew and developed. "The most pressing need at present is that of Market Street," he wrote.

Bi  n Arnold, transportation engineer who designed the Twin Peaks Tunnel, in 1913 in his Report on the Improvement and Development of the Transportation Facilities of San Francisco, stated that "Provision for a Market Street subway should be incorporated in any Twin Peaks tunnel project--i.e., the alignment and grade of the tunnel under the hill should be such as to emerge directly into a suitable subway bore under Market Street, whether the latter is built now or in the future."

The subtitle of City Engineer M. M. O'Shaughnessy's report in 1931 on Rapid Transit Plans for the City of San Francisco--With Special Consideration to a Subway Under Market Street indicates the growing importance of the Market Street problem by that time. His was the first study and report to make specific proposals for immediate subway construction to solve the Market Street problem by separating the main flow of transit traffic along that thoroughfare from other types of conflicting traffic.

A comprehensive plan of rapid transit routes was proposed of which the main elements were: 1) a Market Street subway from the Bay Bridge Terminal, through the Twin Peaks Tunnel, and down Nineteenth Avenue to the county line near Junipero Serra and Alemany Boulevards, with initial construction proposed under Market Street from First Street to Gough Street; 2) a Mission route running under Mission and Capp Streets, and along the old Southern Pacific right-of-way through the Bernal Cut to a junction with the Twin Peaks Tunnel route near the county line; 3) a route under O'Farrell and Geary Streets to Park-Presidio Boulevard; and 4) a route through the Sunset Tunnel to a terminal near 20th Avenue and Irving Street. Street cars were proposed for operation in this system.

In 1936, in a report to the Public Utilities Commission rendered by its staff and Robert Ridgway and Alfred Brahdy, Consulting Engineers, on Rapid Transit for San Francisco, a subway system for initial use by street cars was recommended consisting of: 1) a Market Street subway from the Bay Bridge Terminal to Church Street with 2) a branch off Market Street under South Van Ness Avenue and Mission Street, and through the Bernal Cut to Balboa Park; and 3) a line under Montgomery and Geary Streets to Hamilton Square. A future connection from the Bay Bridge Terminal under Rincon Hill to the Peninsula trunk line at Third and Townsend Streets was also suggested.

This plan was put before the voters in a general obligation bond issue of \$49,250,000, in November of 1937. The bond issue was defeated by a vote of 95,246 in opposition to 68,834 in favor. The defeat was ascribed to the fact that the City's transit was then split between the system of the Market Street Railway Company, which carried two-thirds of the total transit riders, and the system of the Municipal Railway, which carried one-third of the total volume of transit passengers. The subway plan was designed to serve only the Municipal Railway system, benefiting directly only one-third of the transit riders. One of the arguments against the plan at the time was that the City should first acquire the Market Street Railway System and combine it with the municipal system before embarking on a rapid transit program. Acquisition of the Market Street Railway was accomplished seven years later, in 1944, thus clearing the way for development of a unified system of transit serving all districts of the City equally.

In 1947 the Joint Army-Navy Board in its report on An Additional Crossing of San Francisco Bay recommended development of a transbay rapid transit system as the only long-range solution to the transbay transportation problem, and it also made general recommendations for a network of subways in San Francisco including a main line under Market Street.

More recent studies and reports are discussed in detail in the report of the engineering consultants, De Leuw, Cather & Company, dated April, 1950 which is transmitted as Part II of this report.

It is worthy of attention that essentially all previous recommendations agree on the need for a rapid transit subway under Market Street as the major step toward alleviating the conditions of congestion in Downtown San Francisco. Furthermore, there is remarkable similarity between the functional aspects of the systems as recommended for the outlying areas of the City.

Of all the previous recommendations, only one has been carried to the test of submission to the electorate. Thirteen years have passed, and there have been many changes in conditions: population has increased 27 percent in San Francisco and as much as 200 percent in some adjoining counties; technological advances have improved greatly the speed, comfort, and convenience of rapid transit vehicles and the esthetic aspects of subway structures; the entire surface transit system of San Francisco is now authorized for operation under one management with resultant opportunities for integrating the system into a rapid transit system that will benefit all transit riders.

II. Criteria of a Good Transit Plan

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Review and analysis of the existing transit system and development of a general plan for changes in the system to include provisions for rapid transit, have been made with certain basic objectives, principles and standards as a guide. These criteria are described in this Chapter.

Objectives of the Subway and Transit Plan

The subway and transit plan recommended has been developed to facilitate the attainment to the greatest degree possible of the objectives set forth below.

1. To provide a comprehensive system of transit routes covering every inhabited section or point of interest in San Francisco, located and designed to afford maximum convenience and service-ability and to link all parts together as directly and conveniently as possible.

Data on origins and destinations as derived from the comprehensive Bay Area Metropolitan Traffic Survey of 1947 and from an analysis of the density and distribution of present and future resident population and working population have been used to develop routes which would serve best the greatest number of present and potential riders.

2. To provide San Francisco with complete facilities for the expeditious, convenient, comfortable, and safe movement of persons by public transit vehicles between each neighborhood of the City and 1) the Downtown business and shopping district, 2) other working or employment areas of the City, 3) park and recreation areas of Citywide importance, and 4) all other neighborhoods of the City.

Fulfillment of this objective would make the transit system as attractive for trips which begin and end outside the Downtown district of the City as for trips to and from that focal area.

3. To ensure that the transit system is fully coordinated with the trafficways plan for freeways and major thoroughfares, with all present and foreseeable future Bay Area transit facilities serving the City, and with other major elements of the Master Plan.

4. To provide for the use of various types of transit vehicles, each where most suitable and effective, so that the service as a whole will compare favorably with or be superior to travel by private automobile in relation to such factors as convenience, comfort, speed, safety, and cost to the rider, particularly in travel to and from the Downtown district.

This objective offers the only effective solution to the problem of congestion in the Downtown district.

5. To preserve present desirable land uses and to further and develop desirable future land uses as shown in the Master Plan.

Principles Applied to the Plan

The following principles have been derived from a study of how to attain these objectives, and have been applied in developing the proposed system of rapid transit.

1. The transit system should consist of three principal functional types of routes organized to provide the shortest possible travel time between points of origin and destinations:

(a) trunk line radial routes originating in the Downtown district of the City and extending to the outlying working areas and to business centers and residential neighborhoods in the community areas.

(b) circumferential crosstown routes, crossing and serving as feeders to the radial routes, and connecting outlying residential and business districts directly with each other and with working areas.

(c) shuttle feeder routes connecting outlying neighborhood and hilltop areas with radial routes.

Plates 5 and 6 show these three types of routes on the existing surface transit system, and on the proposed modifications to the system as coordinated with the rapid transit lines.

2. Radial and crosstown trolley and gas bus routes should make maximum use of established trafficways, passing between or skirting residential communities and neighborhoods. In the Downtown district some surface streets should be designated for primary use by transit vehicles, freeing other streets for automobile and other types of vehicular traffic. In outlying residential neighborhoods such transit routes may utilize local neighborhood streets to a limited extent where topographic conditions or the size and layout of the neighborhood requires such use for adequate coverage.

3. Where passenger volumes and length of trips warrant, radial routes should be developed as rapid transit routes providing fast through express service on separate rights-of-way: freeway or expressway roadways for buses, and subways, center divider strips on freeways, or other special rights-of-way at grade for rail transit vehicles.

The recommended rapid transit routes comply fully with this principle.

4. Wherever possible transit lines should be routed on the same trafficway or street in both directions, rather than on one-way streets. Specific streets should be established and identified as transit route streets.

Standards of the Plan

The following standards have been applied in the development of the recommended transit plan:

1. Overall travel time should be as short as possible. The measure of overall travel time should include 1) vehicle running time, 2) time required for walking to or from the point of origin or destination to the point of boarding or alighting from the transit vehicles, and 3) half of the headway between vehicles on the route, i.e., average waiting time.

Plate 7, shows the travel times required during peak hours on the existing transit system. A comparison with the time required to travel by automobile reveals that transit trips today require approximately twice the time required for a comparable trip by automobile. This one factor alone accounts for much of the diversion from the use of transit toward the use of automobiles in the daily journey to work. The recommended rapid transit plan will cut present transit travel time in half, as shown on Plate 8.

2. Standards of service should provide on the average a seat for each passenger during off-peak travel periods and a limit of standees on rubber-tired vehicles to 50 percent of the number of seated passengers per vehicle during peak travel periods.

San Franciscans, habituated to conditions of crowding, push into transit vehicles far beyond their comfortable capacity. An increased number of transit vehicles and improvements in surface traffic conditions so that schedules may be more easily maintained, will aid in the achievement of this standard. The construction of a subway under Market Street, however, will afford the greatest relief to present conditions of transit congestion.

3. Transit routes generally should be so located to provide service to any developed part of the City within one-quarter mile walking distance, i.e., five-minute walking time. The average spacing between transit lines should be approximately one-half mile except in areas of high population density or where special topographic conditions prevail, where closer spacings may be necessary.

The present transit system, being a composite of two formerly distinct and separate systems - those operated by the Market Street Railway and by the Municipal Railway - is characterized by duplication of routes in older areas of the City, and by a degree of under-service in newer areas of the City. The present rehabilitation program of the Municipal Railway offers opportunities for elimination of overlapping routes, and consequent better service on remaining routes. The subway and rapid transit system recommended in this report further enables this standard of transit service to be attained.

4. The transit system should provide generally for a transit trip from any part of the City to any other without inconvenient multiple transfers.

The present practice of shortening radial routes by a turn-back at Market Street during off-peak hours, requires at least one transfer to complete a radial trip into the Downtown area, and at least two transfers to make connections between radial lines from the north and south and radial lines to the west. The resulting inconvenience is a deterrent to the use of transit during off-peak hours which the proposed rapid transit system would overcome.

5. Sheltered waiting stations should be provided at all transfer points and at all other major loading points.

Plate 11 shows a perspective drawing of the transfer terminal proposed at St. Francis Circle. All stations on the subway routes would be designed to permit easy over-the-platform transferring from feeder bus routes to the rapid transit trains without requiring hazardous crossings of streets and intersections.

6. Transit vehicles should provide optimum passenger comfort through clean appearance and design, good ventilation, generous windows, wide entrance and exit doors, minimum noise, and smooth acceleration and deceleration.

The rapid transit vehicles proposed for operation on the subway routes, described in Chapter III and on page 19 of the engineering consultant's report, fully meet these standards.

III Recommended Subway and Rapid Transit Plan

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It takes almost twice as long in travel time from the Downtown district to reach outlying residential districts--such as the Richmond, Sunset, West of Twin Peaks, Mission, or Bayview--by public transit than it does by automobile. To counter this great advantage of the automobile, one of the primary aims in the development of a public transit system that will compare favorably in terms of convenience, comfort, and cost, with travel by automobile is to make more nearly equal the travel times by the two types of facility.

In order that this may be accomplished in San Francisco the areas more than three miles from Montgomery and Market Streets--west of Presidio Avenue and Eureka Valley and south of Army Street--must be brought closer to the Downtown district by means of rapid and express transit service. A comparison of Plate 7, showing existing transit travel time zones from Montgomery and Market Streets during peak hours, with Plate 8, showing time zones that would result with the development of the rapid transit system here proposed, shows that the usual transit trip can be cut in half by development of the proposed system.

The subway system proposed shown on Plate 3, consists of four radial trunk-line rail subway routes to serve the western and southwestern sections of the City, and trunk-line express bus routes on the Bayshore Freeway to serve the southeast section of the City.

The routes recommended are:

1. Twin Peaks Route - Market Street.

The proposed Market Street Subway extends from the Bay Bridge Terminal at Mission and Fremont Streets via a loop running under Beale Street, Pine Street, and Sansome Street to Market Street, and thence west to the Twin Peaks Tunnel. The subway is two-track west of Sansome Street, the eastbound loop track running via First Street to the Bay Bridge Terminal. The Twin Peaks Route extends west from the Market Street subway through the Twin Peaks Tunnel and under West Portal Avenue, the existing Municipal Railway right-of-way through Lakeside, under Nineteenth Avenue and Worcester Street, and across the Stanley Drive Parkway to a terminal at the Southern Pacific right-of-way near the county line. The total distance of this route is 8-1/2 miles from the Bay Bridge Terminal to its southerly terminal. There are eight stations proposed west of Van Ness Avenue. The total running time between the Bay Bridge Terminal and the outer terminal, including stops, is estimated at 28 minutes. From Montgomery and Market Streets to St. Francis Circle, the peak-hour total running time would be 18 minutes. Feeder and crosstown bus routes serving hilltop, lakeside, and oceanside neighborhoods would connect with this rapid transit route at Church Street, Eureka Valley, Forest Hill, West Portal, St. Francis Circle, Stonestown, and Parkmerced.

2. Sunset Route - Market Street.

The Sunset Route branches off the Market Street subway at Duboce Avenue and extends west from the Sunset Terminal in subway to Arguello Boulevard and Lincoln Way, and then along the south side of Golden Gate Park--the route of the southern branch of the Panhandle Freeway--to a terminal at Nineteenth Avenue. There are four stations proposed west of Van Ness Avenue. The total running time between the Bay Bridge Terminal and Nineteenth Avenue including stops, is estimated at 19-1/2 minutes. From Montgomery and Market Streets to Nineteenth Avenue, the peak-hour total travel time would be 16-1/2 minutes. Feeder and crosstown bus routes

serving the slopes of Buena Vista and Twin Peaks, Parnassus Heights and Golden Gate Heights, and the entire Sunset district, would connect with this rapid transit route at Church Street, Cole or Stanyan Street, Ninth Avenue, and Nineteenth Avenue.

3. Mission Route - Market Street.

The Mission Route branches off the Market Street subway at Van Ness Avenue and extends south under South Van Ness Avenue and thence along the central mall of the proposed Mission Freeway to a common terminal with the Twin Peaks route near the junction of Alemany and Junipero Serra Boulevards. Permanent vehicle storage facilities are proposed at this terminal point. Extension along the Southern Pacific right-of-way and City-owned right-of-way of the abandoned San Mateo Interurban streetcar line as far as San Bruno would provide trunk line service to the rapidly developing hills and valley in northern San Mateo County, southwest of Lake Merced and the San Bruno Mountains. There are seven stations proposed south of Van Ness Avenue and north of the county line. The total running time between the Bay Bridge Terminal and the outer terminal near the county line, including stops, is estimated at 24 minutes. From Montgomery and Market Streets to Army Street the peak hour total travel time would be 12 minutes; to Balboa Park and City College 18-1/2 minutes. Feeder and crosstown bus routes would connect with this rapid transit route at Sixteenth Street, Twenty-second Street, Bernal, Glen Park, Balboa Park (Ocean Avenue), and Sagamore, and buses serving the residential districts in northern San Mateo County would connect with the line at its county line terminal, until it can be extended southward toward San Bruno.

4. Geary - Park-Presidio Route.

The Geary route is proposed as a two-track subway extending from Montgomery Street under Geary Street, and in the center mall of Park-Presidio Boulevard, developed as a freeway, to California Street. There are seven stations proposed west of Van Ness Avenue. From Montgomery and Market Streets to Geary and Park-Presidio Boulevards, the peak-hour total travel time would be 14 minutes. Feeder and crosstown bus lines serving the Richmond District and the Western Addition would connect with this rapid transit route at all stations.

Serious consideration was given in this study to the extension of the Sunset Route northward across Golden Gate Park and along Park-Presidio Boulevard in lieu of the Geary route. However, the damage to the Park that would be required, the greater travel time, and the lesser number of persons north of the Park served by this line, all led to the conclusion that the Geary Route is more desirable and economically justifiable.

Integration With a Bay Area Transit System

The need for improved transit facilities is not restricted solely to San Francisco, but extends throughout the Bay Area. Action on the problem from an Areawide approach seems likely to occur in the not very distant future. The Army-Navy Board, in its report on An Additional Crossing of San Francisco Bay gave impetus to development of a regional transit plan, legislation authorizing creation of a Bay Area Transit District was passed in 1949, a citizens' advisory committee presently is actively considering the areawide needs, at least one privately owned company serving suburban areas has indicated a desire to abandon its operations entirely, East Bay cities are considering a joint attack on their problem, and interest is generally stirring throughout the Bay Area toward development of a fully integrated system of transit serving the entire Bay Area.

The rapid transit plan proposed for San Francisco has been developed to fit into an Areawide system of transit. In the recommended plan the Bay Bridge Terminal is a focal connecting point between the system serving San Francisco and the systems serving Transbay and Peninsula communities. The Bay Bridge Terminal presently serves the San Francisco-Oakland Bay Bridge transit routes, and the Market Street subway is designed to afford an easy transfer from one system to the other. (See page 12 of the report of the engineering consultants regarding the difficulties of a direct rail connection between the Bay Bridge tracks and the Market Street subway.) Future extension of the main Peninsula route, when present equipment is modified, from Third and Townsend Streets under Rincon Hill to a subway terminal at the Bay Bridge Terminal would provide for interchange between Peninsula and San Francisco and Peninsula and Transbay facilities.

Marin County could be integrated into the local system by a terminal at Park-Presidio Boulevard tying in with the Geary route in lieu of a downtown bus terminal. The Golden Gate Bridge was designed to accommodate monorail facilities although monorail is as yet untried and unproven as a media of rapid transit. Although there may be advantages in favor of monorail in suburban areas, overhead monorail systems would be physically and esthetically undesirable on the crowded and congested streets of downtown San Francisco. Connection with the Geary subway route, should a Marin monorail system be developed in the future, would overcome this disadvantage.

The Geary route could also be tied in to the Bay Area system by terminating at the Bay Bridge Terminal. However, so far as San Francisco users of the route are affected, a terminal in Montgomery Street would be more advantageous. A transfer station to the Market Street subway at Kearny Street would afford ready access to the Bay Bridge Terminal, and it is this less costly facility for which cost estimates have been provided by the engineering consultants.

The Downtown Subway

Downtown San Francisco is a concentrated terminal area. It is there, between Van Ness Avenue and The Embarcadero, particularly along Market Street and the adjacent streets on the north, that a large majority of all transit riders either begin or end their trips. Therefore no stations in the Downtown district could be bypassed. The proposed rapid transit system will provide express service to the downtown district, but within the downtown area stops should be made at each station.

There are seven stations on the Market Street route between the Bay Bridge Terminal and Van Ness Avenue, a distance of two miles, some proposed at intervals as close as 900 feet in order to disperse adequately the concentrated volumes of passengers with destinations in the area. Nonetheless, the subway under Market Street would afford more than a one hundred percent saving of time east of Van Ness Avenue, where the bulk of the congestion and delay now occurs. In contrast with scheduled peak hour streetcar running times of 17-1/2 minutes between the Bay Bridge Terminal and Van Ness Avenue, and actual running times as high as 30 minutes, the rapid transit cars in the subway would make the trip during peak hours in 9 minutes, including stopping time at the stations. From Montgomery Street to Van Ness Avenue the running time would be 6 minutes, including stopping time.

In addition to breaking the Market Street bottleneck for the 240,000 passengers estimated to use the subway system daily by 1970, it is estimated that the Market and Geary subways will remove from the surface of Market Street one-half of the passenger load which would be forced to use that street if no subway were provided.

Station Design

The engineering consultants have recommended the construction of side platform stations rather than mezzanine stations along Market Street (see page 16 of their report). There are advantages and disadvantages for either type of station. Mezzanine stations, with a floor between the track level and the street level, provide greater flexibility for pedestrian movement, enabling passengers to enter the stations from either side of the street and reach either track. Mezzanine stations are also advantageously adapted to irregular street patterns, as entrances can be provided from any point. In addition, adjoining buildings may be connected directly with the stations.

On the other hand, mezzanine stations require an additional depth of ten feet, adding to the length of the descent or climb from or to the sidewalk level. Cost estimates for the provision of mezzanine stations between Van Ness Avenue and the Bridge Terminal would add \$3,300,000 to the total cost of the subway. Construction of mezzanines at the Fourth, Third, and Second Street stations, where the greatest movement of passengers occurs, add \$1,600,000 to the total cost. After considerable deliberation and evaluation of the relative advantages and disadvantages, it is recommended that mezzanine-type stations be constructed at Fourth, Third and Second Streets.

Equipment

It is recommended that the rapid transit subway route be operated with cars specially designed for rapid transit operation. Generally similar to PCC street cars in appearance, weight, acceleration, and speed, the cars are 48 feet in length, 10 feet in width, provide seats for 50 passengers, and operate in multiple units of two, four, and six car trains. Each has three doors for loading and unloading, thus expediting the movement of passengers at heavy-volume downtown stations. Both in comfort and attractiveness, this car surpasses all existing types.

The Surface Plan

Plate 6 shows a suggested plan for surface transit routes to serve and supplement the rapid transit subway system recommended. This surface plan is not intended to be considered, nor is it submitted as, a precise plan. However, it was used as a basis for estimates of passengers boarding the subway lines at each station and is shown only to illustrate how the surface transit system can be integrated into the subway system in accord with the principles and standards set forth in Chapter III. Specific routes and details of the plan will be developed and determined by the staff of the Public Utilities Commission and Col. Marmion D. Mills, consultant to the Public Utilities Commission, as the present rehabilitation program for the transit system is carried out.

It will be noted, however, how the surface system can be clearly divided into subway feeder lines, crosstown lines, and surface radial lines serving primarily the areas less than three miles from Montgomery and Market Streets. Together with the subway line proposed and express bus operation on the Bayshore Freeway, this transit system would make possible the travel times shown on Plate 8 as well as greatly simplifying and improving crosstown transit facilities.

In order to make possible this improved surface system, additional funds for completion of the rehabilitation of the present system are required. Replacement of remaining street car lines operating on the surface by trolley or gas buses,

whichever is most appropriate, and purchase of additional equipment to improve service standards, is recommended as an essential part of the next step in the transit improvement program. Total cost for this requirement will be estimated by the staff of the Public Utilities Commission.

The People Served

Plate 9 shows the growth of population between 1920 and 1947 throughout San Francisco, and the estimates made by the Department of City Planning of additional growth up to a total of 875,000 in 1970. It can be seen clearly that heaviest residential growth will occur in the southwestern section of the city. Nearly all parts of the City will experience some population growth, but the outlying sections obviously will increase the most. Some few sections are likely to lose residential population through redevelopment for industrial and commercial purposes. All of these probable changes have been considered in developing the recommended rapid transit plan.

Plate 4 shows the estimated daily volume of passengers using the subway routes based on 1950 and 1970 population estimates.

The Cost

Total estimated cost, exclusive of rapid transit cars, for the Twin Peaks, Sunset, and Mission routes, all using the Market Street subway, is \$87,000,000. The Geary subway, recommended for last priority construction, is estimated to cost \$47,000,000, making a grand total of \$134,000,000 for the complete rapid transit system.

In order that the construction program may be carried out within the limits of the City's financial structure, it is recommended that the system be built in stages, the first stage to include 1) the Market Street subway as far west as Gough Street, and the Twin Peaks route as far west as St. Francis Circle, and the Sunset route as far west as Nineteenth Avenue.

Costs for this recommended first-stage construction program, estimated by the consulting engineers, consist of the items and amounts listed below:

Twin Peaks Route - Market Street

1. The subway construction from the Bay Bridge Terminal to the incline to the surface of Market Street at Gough Street is estimated to cost.....\$18,400,000
2. Maintenance and restoration of underground utilities is estimated to cost..... 3,500,000
3. Additional cost for the three mezzanine-type stations recommended is..... 1,600,000

Thus the total cost of basic subway construction on Market Street is.....\$23,500,000

4. Land and buildings on the site of the proposed Division Terminal (described on page 19 of the consultants' report) are estimated to cost..\$3,450,000
5. Structures and fixed equipment for the Division Terminal are estimated to cost..... 3,350,000

The total outlay for the Division Terminal is thus.....\$ 6,800,000

However, since the area above the ground level will not be required for transit use, the air rights can be resold and the acquisition costs thus can be partially or entirely recouped.

6. Lowering the track in the westerly portion of the Twin Peaks Tunnel, construction of a subway under West Portal Avenue and a terminal at St. Francis Circle is estimated to cost..... \$5,600,000
7. Maintenance and restoration of underground utilities along this section is estimated to cost..... 200,000

Thus the total cost of the westerly section of the Twin Peaks route is..... \$5,800,000

8. Fixed subway equipment including track, signal, D.C. power and distribution, supervisory control, A.C. distribution, emergency alarm, communication, ventilating, and station equipment for the entire route is estimated to cost.... 5,800,000
9. Sixty rapid transit cars required for the Twin Peaks route are estimated to cost..... 2,700,000

The total cost of initial construction of the Twin Peaks route is thus estimated to be..... 44,600,000

From this figure, however, may be deducted the sale value of the Division Terminal air rights, which would be approximately..... -3,000,000

The net cost of the Twin Peaks route would thus be..... \$41,600,000

Sunset Route

Estimates for the first-stage construction of this route were made by the consulting engineers in their report for two alternative western terminals--one at the present westerly portal of the Sunset Tunnel at Cole Street, and one requiring an extension of the route west to Stanyan Street. However, at a meeting on April 5 attended by Marmion D. Mills, Consultant to the Public Utilities Commission, William Scott, General Manager of the Municipal Railway, A. O. Olson, Chief Engineer, Utilities Engineering Bureau, L. M. Perrin, Senior Engineer, Utilities Engineering Bureau, Charles E. De Leuw, Consulting Engineer on the rapid transit plan, and Paul Oppermann, Director of Planning, it was agreed that the Sunset route should be carried to its ultimate westerly terminal at Nineteenth Avenue in the first stage of construction as the benefits of this extension would more than offset the additional cost required. This route therefore is recommended for construction as far west as Nineteenth Avenue in the first stage.

Cost estimates for this route have been submitted by the consulting engineers for a modified plan based on continued surface operation on Duboce Avenue in the first stage, and a Stanyan Street terminal requiring less property acquisition. The estimates are based on subway construction west to Arguello Boulevard and Lincoln Way, and a limited-access right-of-way on grade along the southern border of Golden Gate Park to Nineteenth Avenue.

1. The estimated cost for the subway section and grade-separated surface section west of Stanyan Street and for additional stations is.....\$4,500,000
2. Fixed equipment is estimated to cost..... 350,000
3. The original estimate of the Sunset project west to Stanyan Street (see page 23 of the engineering consultants' report) less land costs of \$220,000 originally included for a more extensive transfer terminal than required under the modified plan, is..... 2,300,000
4. The cost of 30 rapid transit cars required for this route is..... 1,350,000

The total cost for initial construction of the Sunset Route to Nineteenth Avenue is thus estimated to be.....\$8,500,000

Total Cost of Recommended First-Stage Rapid Transit Construction: \$50,100,000

The total net cost of the rapid transit and subway system recommended for the first stage of construction is thus \$50,100,000.

It is further recommended that sufficient funds be authorized to complete the rehabilitation of the surface transit system and make available a complete fleet of modern, efficient, postwar transit vehicles. This cost will be estimated in detail by the engineers of the Public Utilities Commission.

The financial aspects of the recommended first-stage construction program are now under study by the Controller as to their application to the bonded debt structure of the City and County.

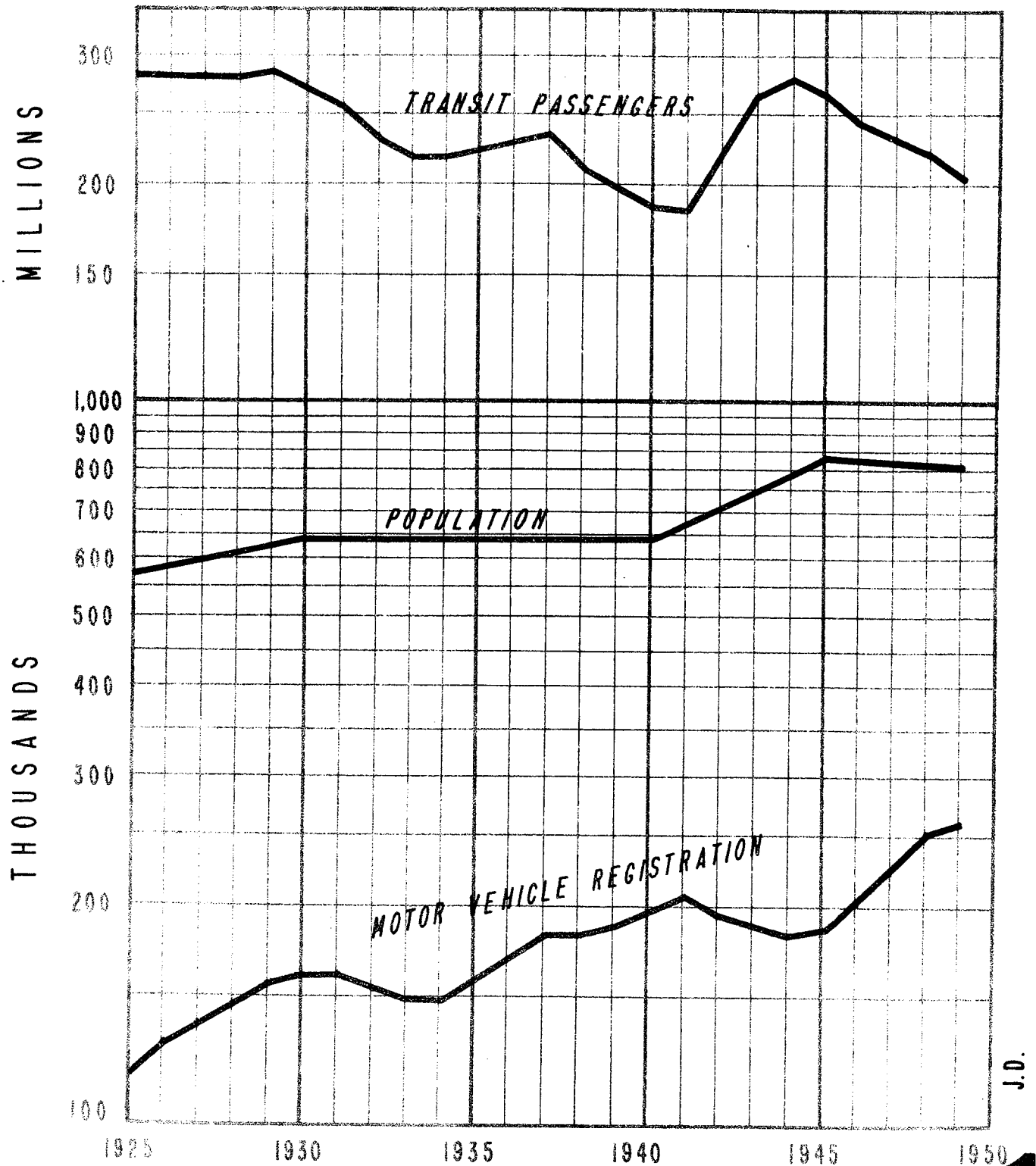
Previous Expenditures for Other Utilities and Public Facilities

San Francisco in the past has not been niggardly in its expenditures for certain other types of public utilities and facilities. Situated in a State where water is of life-or-death importance, San Francisco has not been confronted, nor will it be faced, with the problem of water shortage. San Francisco displayed foresight in the development of water acquisition, storage, and distribution facilities and has authorized nearly \$173,000,000 in bonds for the development of the Hetch Hetchy system and the local water distribution system.

San Franciscans have authorized the issuance of \$35,000,000 in bonds for sewer construction and improvements. The issuance of \$75,000,000 in bonds for development of school facilities has been authorized. San Franciscans have authorized the issuance of \$33,000,000 in bonds for development of its airport, a transportation facility directly benefitting relatively few San Franciscans.

Compared with these past expenditures, it does not seem disproportionate to pay \$50,100,000 for a transportation improvement that will have lasting value and that will benefit directly every property owner and every resident in San Francisco.

COMPARISON OF RESIDENT POPULATION, MOTOR VEHICLE REGISTRATION, AND REVENUE TRANSIT PASSENGERS IN SAN FRANCISCO: 1925 - 1949



SUBWAY AND RAPID TRANSIT SYSTEM

SUBWAY FIRST STAGE

SUBWAY LINES

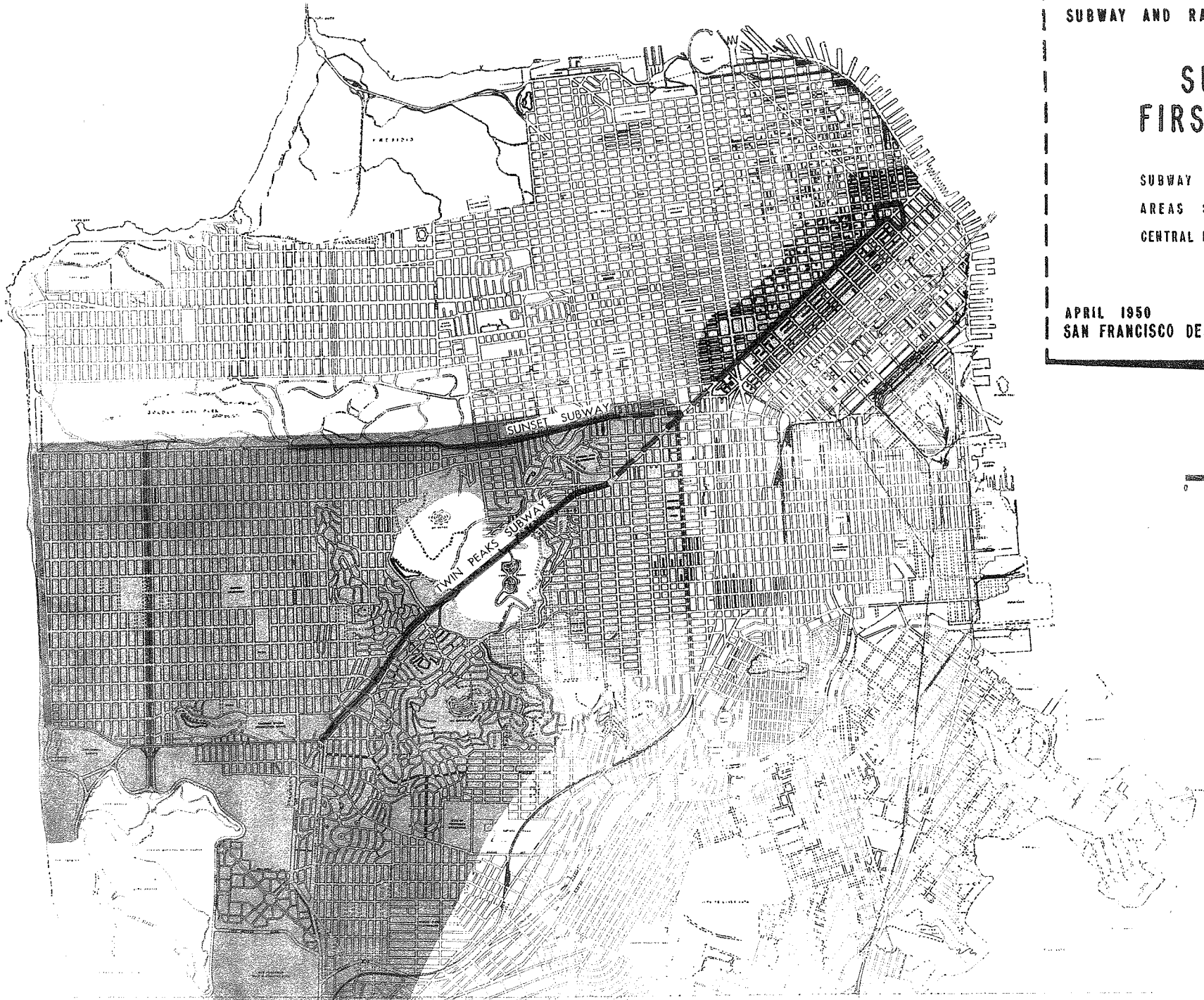
AREAS SERVED

CENTRAL DISTRICT

APRIL 1950 PLATE 2
SAN FRANCISCO DEPARTMENT OF CITY PLANNING



PLATE
2



SUBWAY AND RAPID TRANSIT SYSTEM

SUBWAY
FIRST STAGE

SUBWAY LINES

AREAS SERVED

CENTRAL DISTRICT

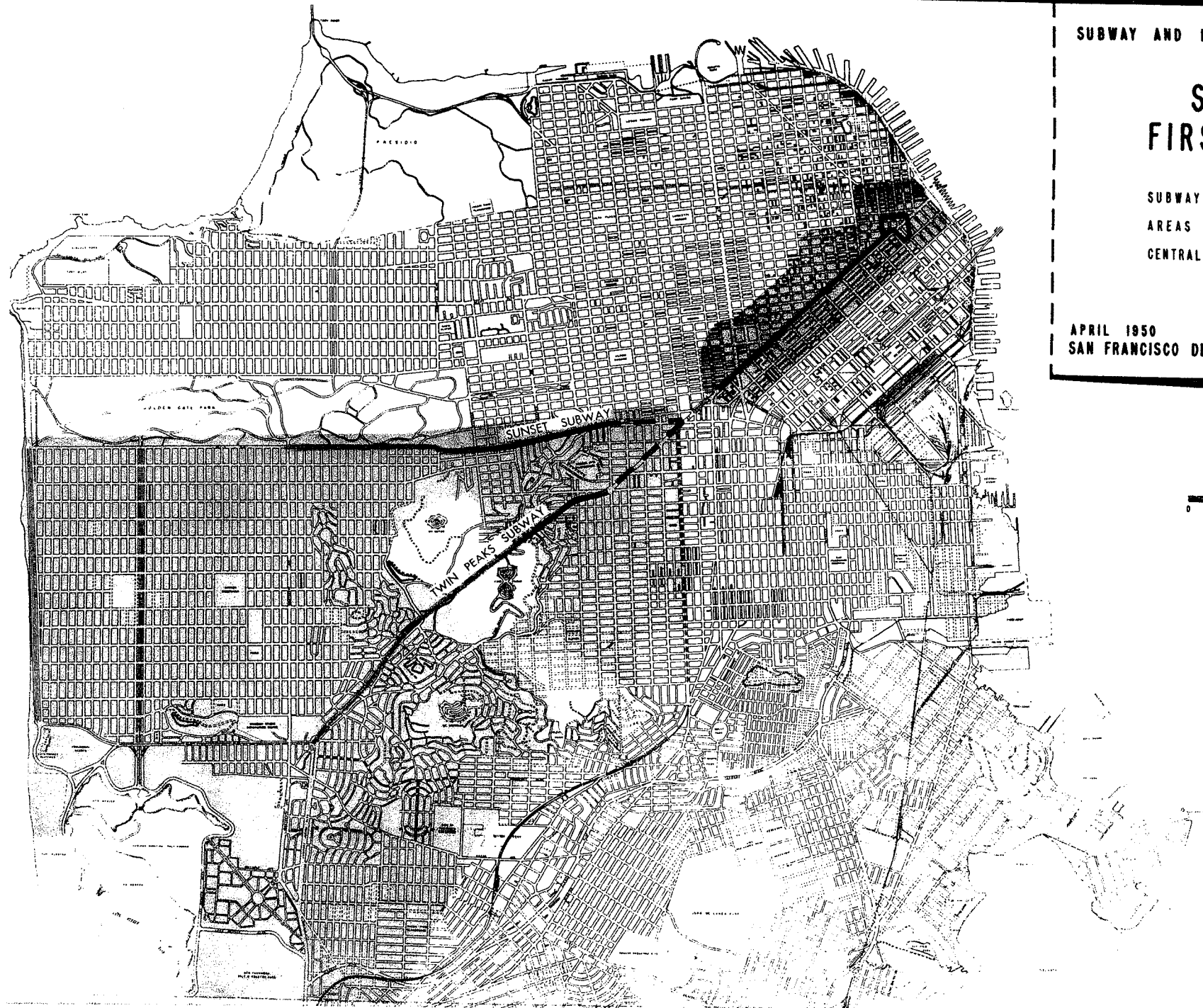
APRIL 1950
SAN FRANCISCO DEPARTMENT OF CITY PLANNING

PLATE 2





PLATE

2

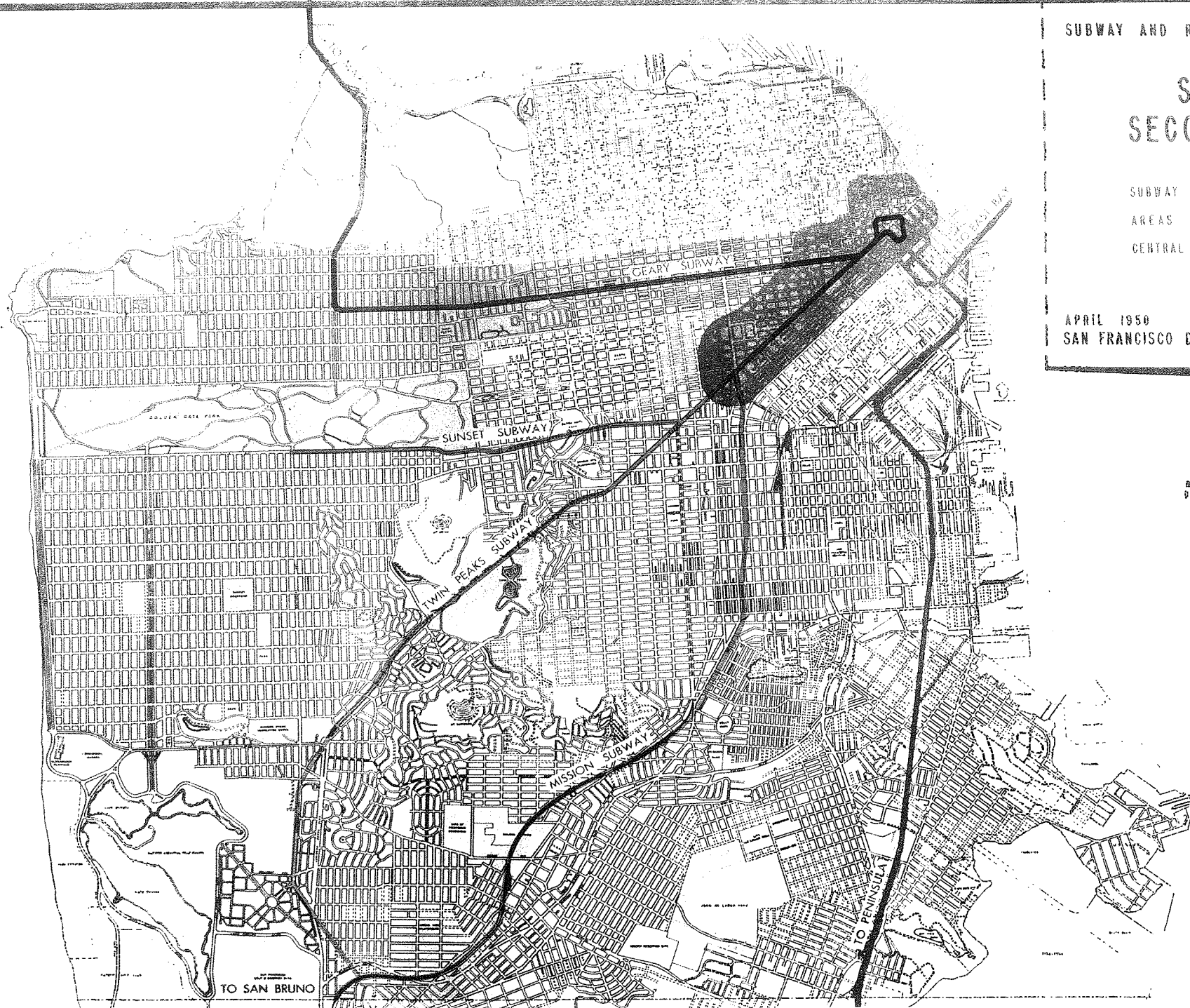


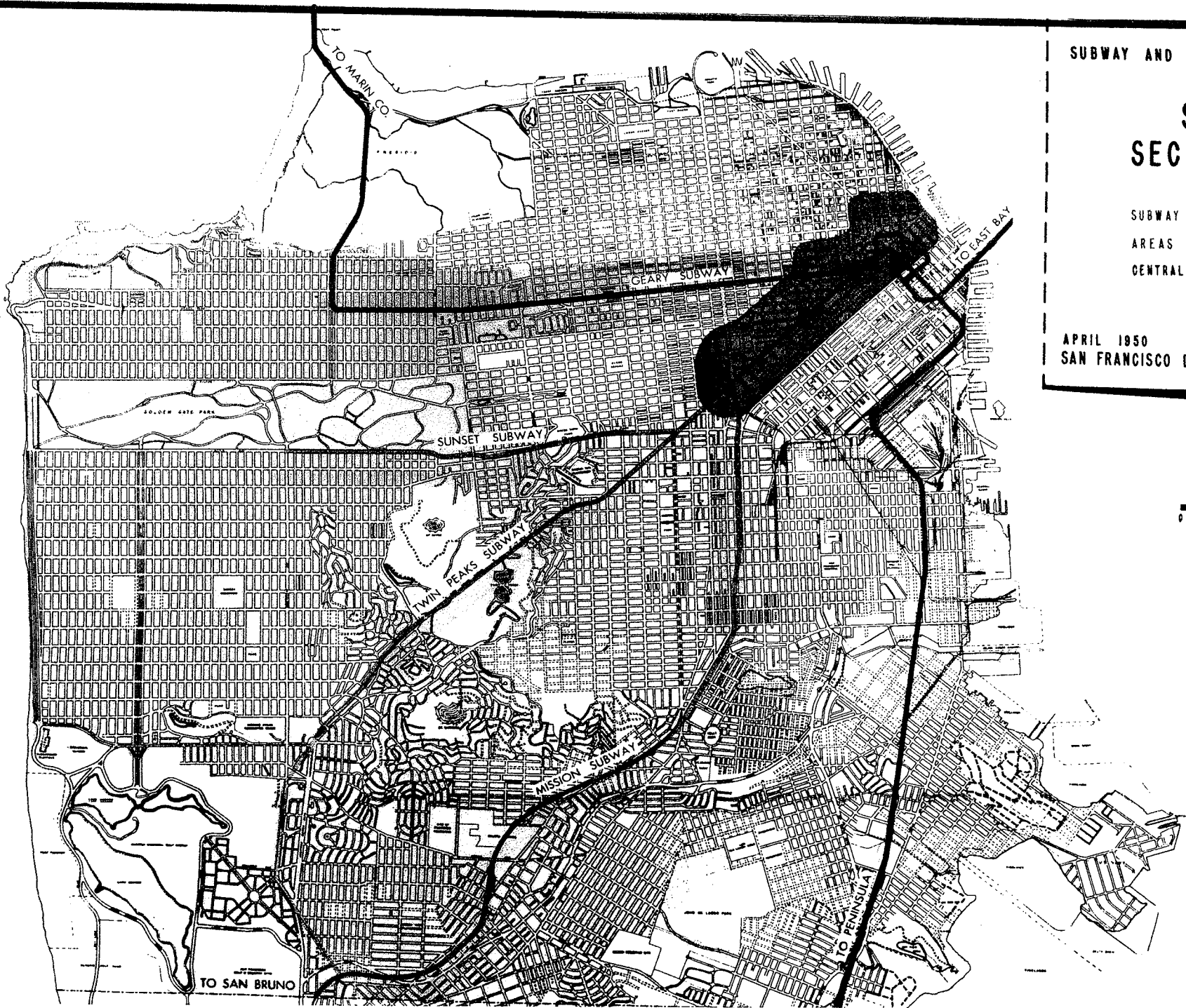
SUBWAY AND RAPID TRANSIT SYSTEM

SUBWAY
SECOND STAGE

SUBWAY LINES ———
AREAS SERVED 
CENTRAL DISTRICT 

APRIL 1950 PLATE 3
SAN FRANCISCO DEPARTMENT OF CITY PLANNING





SUBWAY AND RAPID TRANSIT SYSTEM

SUBWAY
SECOND STAGE

- SUBWAY LINES ———
- AREAS SERVED - - - - -
- CENTRAL DISTRICT [shaded area]

APRIL 1950 PLATE 3
SAN FRANCISCO DEPARTMENT OF CITY PLANNING



SUBWAY AND RAPID TRANSIT SYSTEM

PROPOSED TRANSIT SYSTEM

SUBWAY STATIONS

RADIAL LINES

RADIAL SHUTTLE LINES

CROSSTOWN LINES

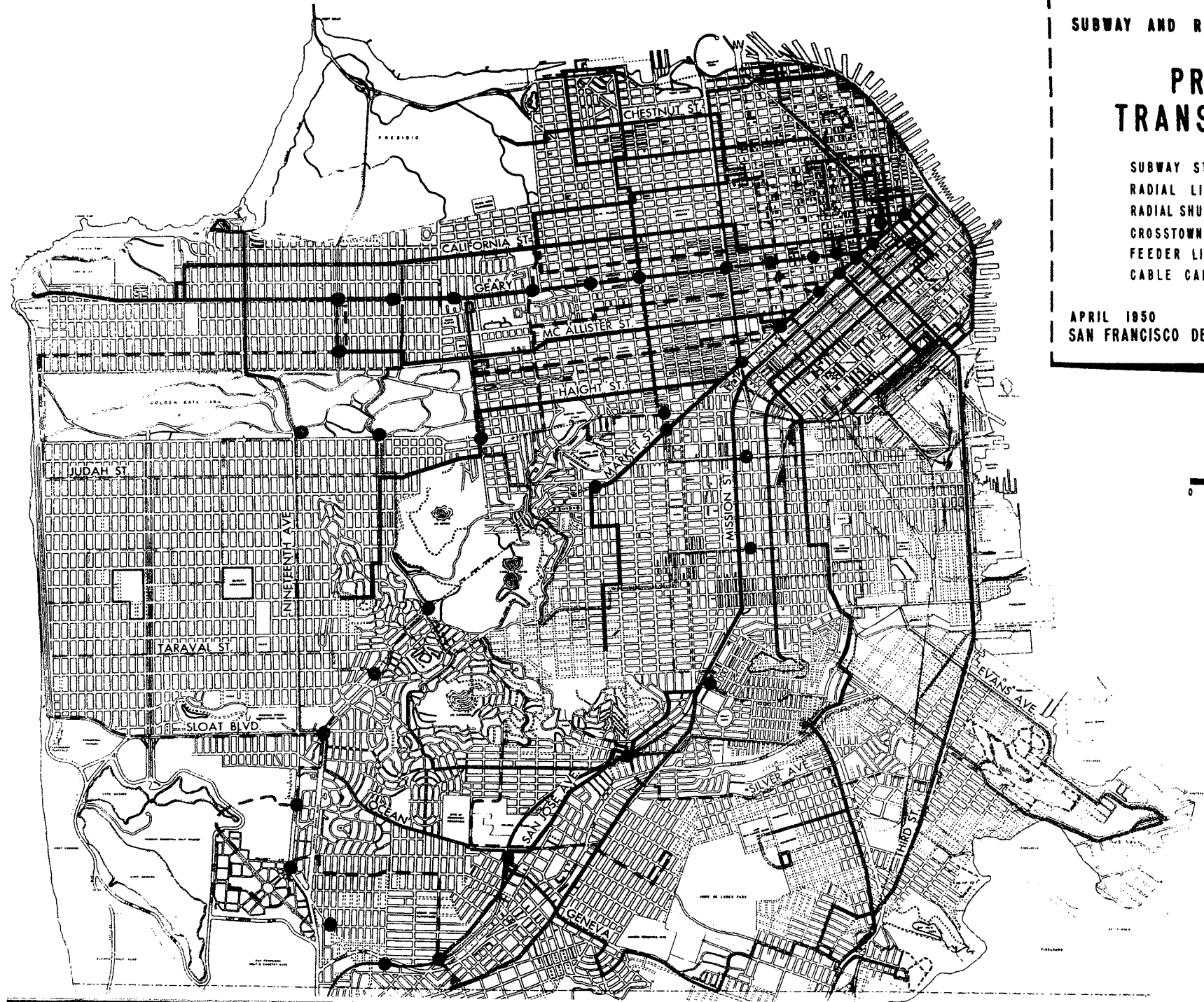
FEEDER LINES

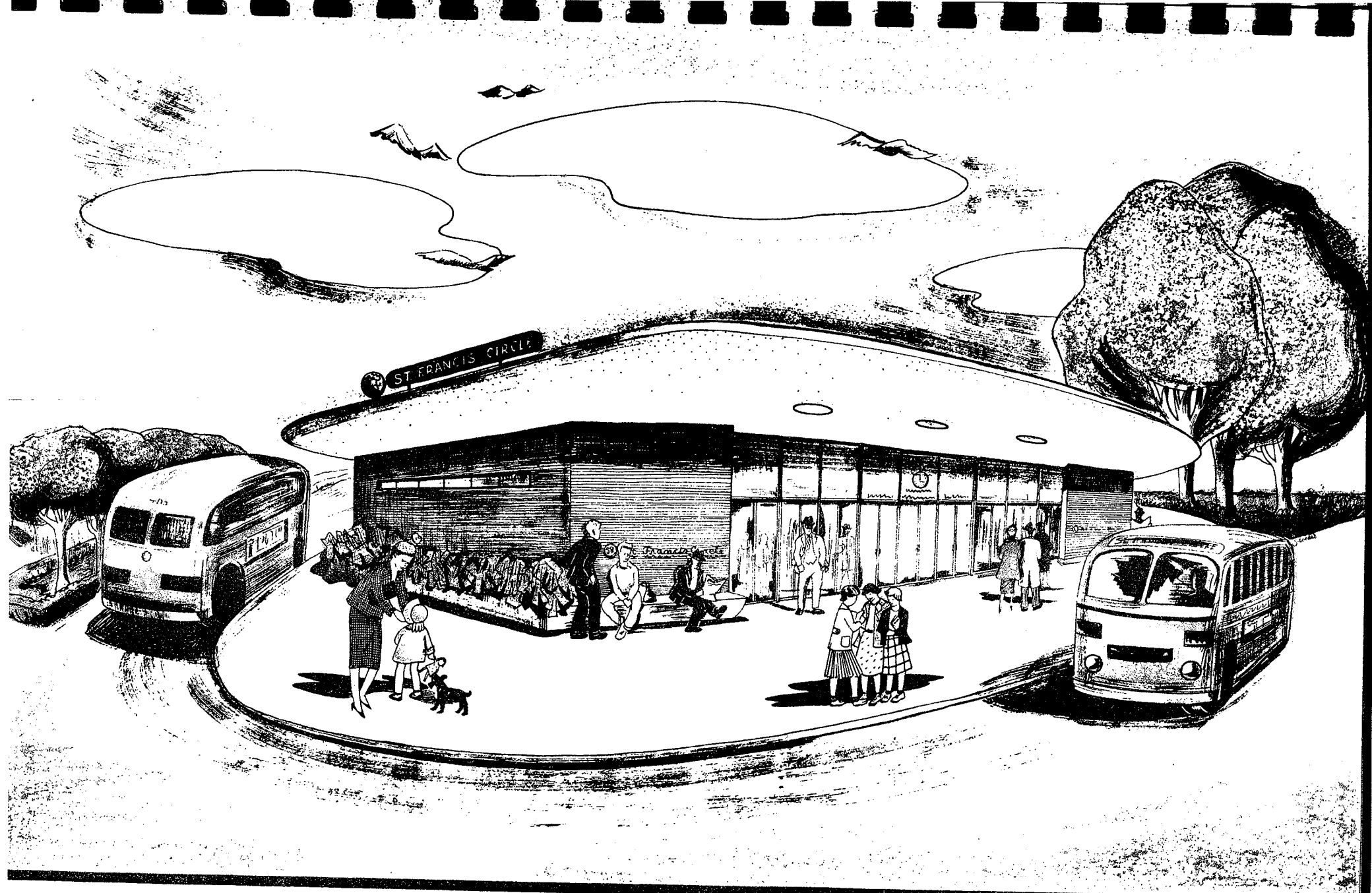
CABLE CARS



APRIL 1950
SAN FRANCISCO DEPARTMENT OF CITY PLANNING

PLATE 6





SUBWAY TERMINAL AT ST. FRANCIS CIRCLE

APRIL 1950

11

SUBWAY AND RAPID TRANSIT SYSTEM
FOR SAN FRANCISCO

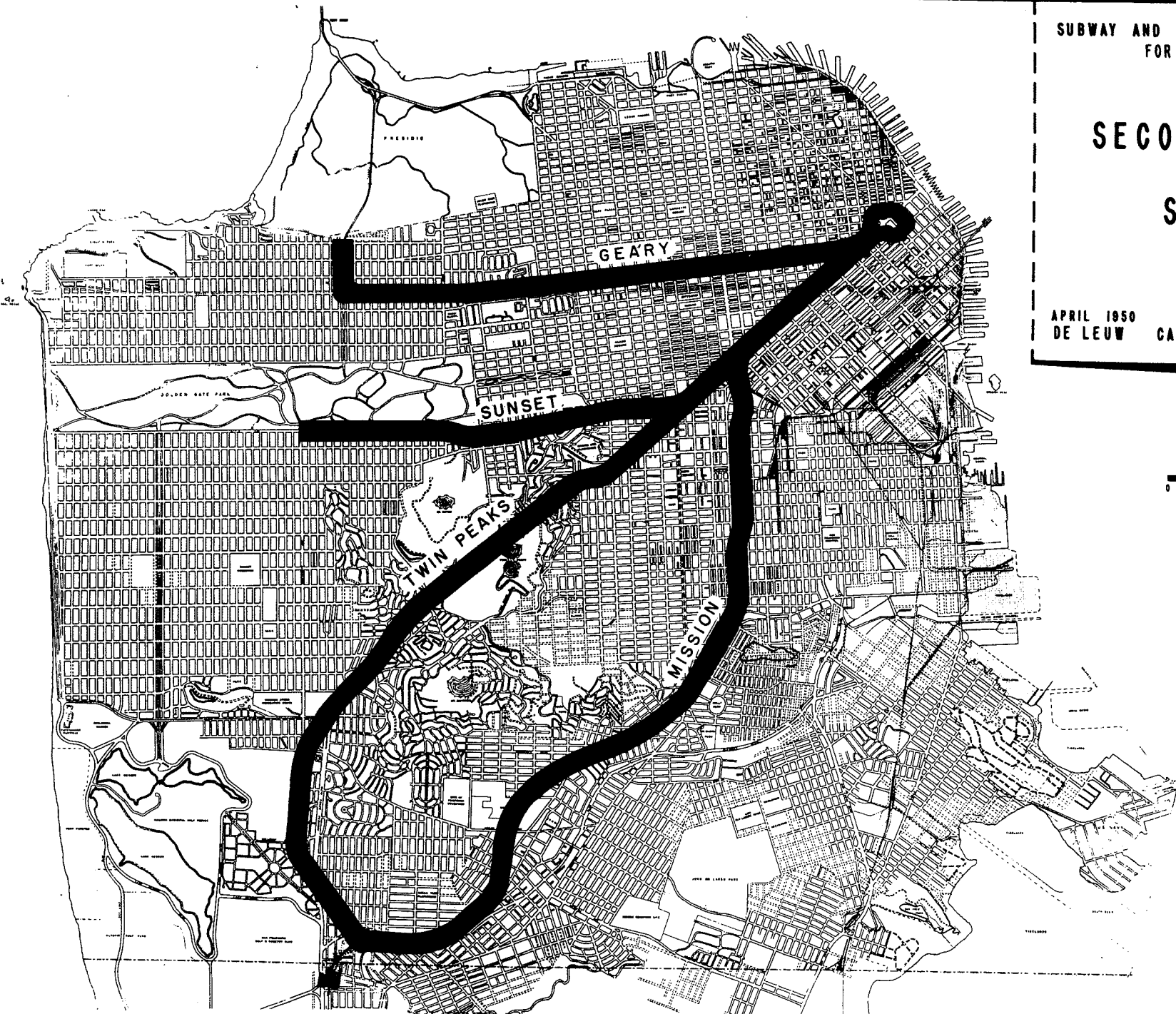
SECOND STAGE SUBWAY

APRIL 1950
DE LEU CATHAR AND COMPANY

FIGURE 1



FIGURE 1



SUBWAY AND RAPID TRANSIT SYSTEM
FOR SAN FRANCISCO

FIRST STAGE
SUBWAY

APRIL 1950
DE LEUW

FIGURE 2
CATHER AND COMPANY

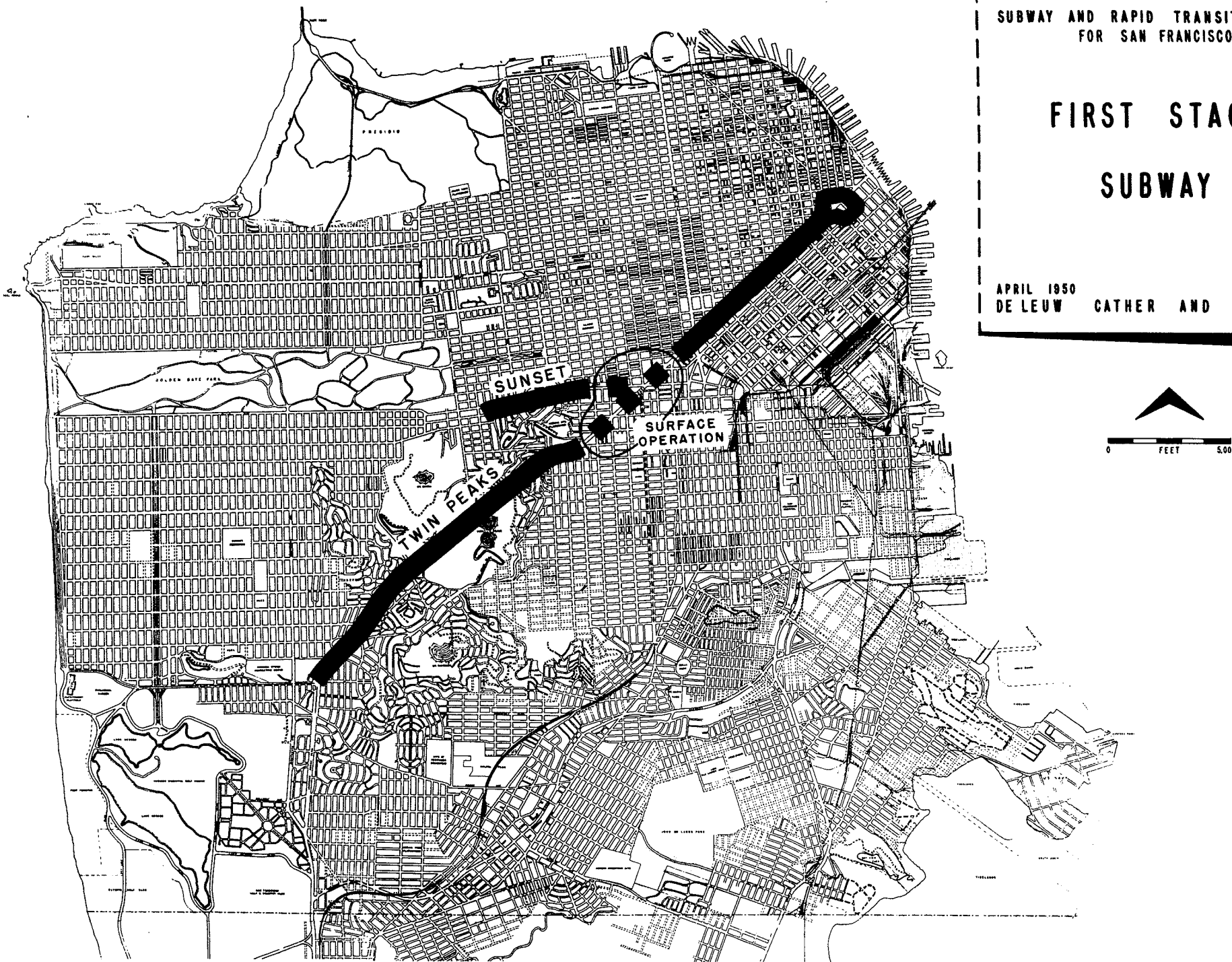


FIGURE 2